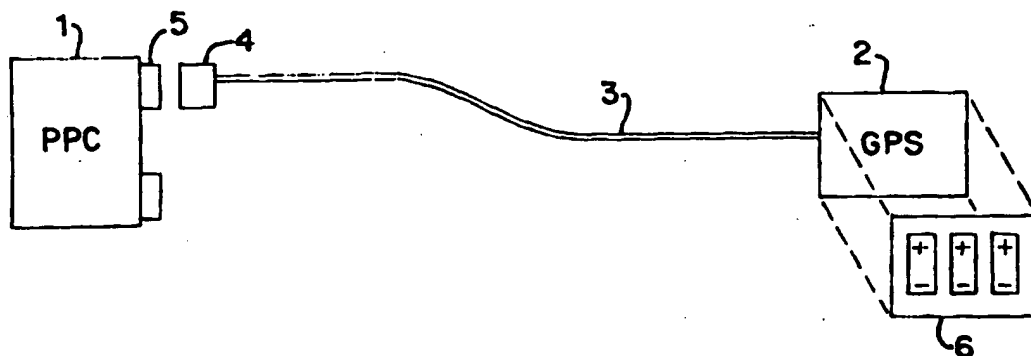


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(71) Applicant: DELORME PUBLISHING COMPANY, INC. [US/US]; Two DeLorme Drive, P.O. Box 298, Yarmouth, ME 04096 (US).			
(72) Inventor: WOOD, Craig, S.; Brackett Road, Gorham, ME 04038 (US).			
(74) Agent: THOMAS L. BOHAN & ASSOCIATES; 371 Fore Street, Portland, ME 04101 (US).			

(54) Title: GPS POWER/DATA CABLE SYSTEM



(57) Abstract

A device for coupling global positioning system (GPS) receivers (2) to computer systems (1) in a way that takes advantage of available power supplies. The device includes an adaptive power base (15) that may be used to replace the standard battery-pack bases (6) of many GPS receivers. The adaptive power base (15) is coupled through an interface cabling system to an external power supply. The power supply may be associated with the computer (1) means, such as a mouse or keyboard port (5), or it may be a completely separate source such as an automobile's cigarette lighter outlet (12). The interface cabling system includes coupling for linking the data communication ports (2, 3, 4, 5) of the GPS receiver and the computer system together. Through the design of the present invention, the GPS (5) receiver is more adaptive to available power sources and therefore may be used for longer periods of time and in a variety of locations. The design is simple in that it includes standard connectors (205, 215).

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## GPS POWER/DATA CABLE SYSTEM

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

5       The present invention relates to position sensor devices such as Global Positioning Satellite (GPS) receivers as portable personal computer (PPC) accessories or peripherals. More particularly, the present invention relates to the coupling of such receivers and computers for data transfer and for supplying power.

10

#### 2. Description of the Prior Art

      In this disclosure, "portable personal computer" or "PPC" includes state-of-the art laptop, notebook and personal digital assistant (PDA) personal computers. In a typical embodiment, geographical information, mapping and/or travel information software is being used on the PPC typically in a vehicle or by the user on foot or at a remote location absent conventional "house current" such as 110 volt AC electrical power outlets standard in residences and workplaces in the United States. Use of the geographic software is enhanced by "real-time" geographic coordinate data supplied by a GPS receiver, for example, the latitude/longitude (lat/long) for the user's present location. For example, in conjunction with a GPS receiver, the PPC can display and update the user's location on computerized maps or in other geographic information formats.

      To function as peripheral accessories in conjunction with a PPC, state-of-the art GPS receivers need an electric power source, typically, within the ranges of 4 to 40 volts DC and 0.1 to 3.0 amps DC. A data link, typically a serial data input/output cable, is also required for communication between the GPS receiver and the PPC of the standard lat/long, speed, direction of travel and precise time signals or data as well as initialization routines and other data exchange. What is needed is a device that facilitates the necessary electrical power supply to the GPS receiver along with the data connection or link between the GPS and PPC through a system or set of options which address

the needs of non-technical users in the major settings of in-vehicle and remote portable use.

## SUMMARY OF THE INVENTION

5           It is an object of the present invention to provide a system capable of supplying power from several sources and also capable of providing data communication interfacing. That is, the present invention is designed to enable use of GPS as a PPC accessory in the typical settings of portable computer usage -- such as use in a remote setting or in the field or "on foot" without any  
10 external electric power supply, and/or in a vehicle such as an automobile or small marine craft equipped with typically a standard 6 to 12 volt DC power supply available by means such as "cigarette lighter" receptacles or outlets, and/or temporary usage as a "desktop" personal computer in typical home or workplace settings with external power provided to the PPC by means of a 110-  
15 120 volt AC to 6-12 volt DC transformer/adaptor. Furthermore, the present invention is designed to enable "easy" changeover between settings: e.g. shifting from "desktop" use at the office or in the home to in-vehicle use and/or changing from a reliable set-up in the user's car or boat to completely "free" or remote portable use in the field with the GPS receiver powered either by its  
20 own standard batteries or by the PPC battery pack. It is desirable to provide alternative power sources for the GPS receiver to conserve the PPC batteries in remote settings. But, at the same time, options for powering the GPS through the PPC external or internal power supply are useful for longer periods of operation in a vehicle, for example, or in case the standard GPS batteries wear  
25 out while PPC battery power still happens to be available, and so forth.

A main object of the present invention, therefore, is first to enable the unsophisticated user to connect up the GPS receiver peripheral or accessory to typical PPCs with minimal effort and technical challenge using fairly familiar equipment like standard batteries and communications or COM port cabling  
30 and connections. A second object is to provide for longer periods of operation and easy installation and shifting between regular in-vehicle use and use on foot or in a remote location by means of various accessory power and data

cable options, typically provided as extra kit at low-cost. A third object is to avoid damage to the standard GPS battery power supply due to accidental connection to an external power source.

## 5 BRIEF DESCRIPTION OF THE DRAWINGS

**FIGURE 1A** is a diagrammatic perspective view of the basic simple set-up of the system of the present invention with the GPS internally powered by standard batteries and a data communication cable connection to a COM port on the PPC (portable personal computer).

10

**FIGURE 1B** is a diagrammatic perspective view of the first type of alternate optional cable, providing data communications between GPS and a COM port of the PPC, plus electric power for the GPS from a typical external source, such as a vehicle cigarette lighter outlet, and to the GPS receiver with an alternative

15

**FIGURE 1C** is a diagrammatic perspective view of the second kind of alternate optional accessory cable, providing data communications between GPS and a COM port of the PPC, plus electric power for the GPS from the standard mouse/keyboard port of the PPC to the GPS receiver with an alternative external power base attached.

20

**FIGURE 2A** is a side view of the GPS receiver with the removable standard battery power base or bottom cover.

25

**FIGURE 2B** is a side view of the GPS receiver with the optional removable external power base or bottom cover.

30

**FIGURE 2C** is a diagrammatic view of an external power cable for coupling to the optional removable external power base or bottom cover.

FIGURE 3A is an external physical layout of the first type of optional accessory data/power cable and fittings for powering the GPS from an external power source such as a 9-12 volt DC cigarette lighter outlet in a boat or car.

- 5     **FIGURE 3B** is a schematic wiring and pin diagram of the first type of optional accessory cable and fittings shown in **FIGURE 3A**.

10     **FIGURE 4A** is an external physical layout of the second type of optional accessory cable and fittings to get power for GPS from mouse/keyboard port on the PPC.

**FIGURE 4B** is a schematic wiring and pin diagram of the second type of optional accessory cable and fittings shown in **FIGURE 4A**.

- 15     **FIGURE 5A** is a physical layout schematic wiring diagram of the jumper arrangement or three-position male connector for power source on GPS printed wiring board or PWB, facilitating safe and ready connection to alternative GPS bottom covers or power bases – plus a schematic wiring diagram of standard GPS data/power cable and fitting.

20

**FIGURE 5B** is a physical layout schematic wiring diagram of the standard battery power base for GPS receiver, showing the three-position female connector.

25

**FIGURE 5C** is a physical layout schematic wiring diagram of alternative, optional external power base for the GPS receiver, showing the three-position female connector.

30

## DESCRIPTION OF THE PREFERRED EMBODIMENT AND THE BEST MODE OF THE INVENTION

FIGURES 1A, 1B and 1C show simplified overviews of electric power and data cabling alternatives to link a PPC 1 with a GPS receiver 2. The GPS receiver has a standard data/power cable 3 and connector fitting 4 attached --  
5 as detailed further relative to FIGURE 5A hereinafter.

FIGURE 1A reveals the simplest cabling arrangement in which electric power is provided to the GPS receiver 2 by means of a removable standard battery power base 6. Data communications between the PPC 1 and the GPS  
10 receiver 2 are provided by the data/power cable 3 by making a standard connection between the attached fitting 4 and the COM port 5 on the PPC 1. Note that the electrical power transmission capability built into the data/power cable 3 is not actually used in the arrangement shown in FIGURE 1. The cabling arrangement in FIGURE 1 functions for remote use of the linked GPS  
15 and PPC i.e. in the absence of an external power source. It also provides for a ready and easy installation for technically unsophisticated users who are nonetheless familiar with standard batteries such as "AA" batteries available at most retail stores and their installation in everyday portable appliances, toys, radios and so forth. The user only needs further to understand or learn how to  
20 manage the simple COM port connection at 4 and 5, comprising one of the most common and easy personal computer cable connecting tasks. Thus, FIGURE 1A illustrates a data/power cabling arrangement preferred for the basic mass-market PPC peripheral GPS receiver product.

FIGURES 1B and 1C illustrate additional data/power cabling alternatives  
25 for supplying external electrical power to the GPS receiver 2 functioning as a PPC peripheral. Both electric power and data signals are transmitted through the standard data/power cable 3 attached to the GPS receiver 2. The alternatives pictured in FIGURES 1B and 1C also require another accessory, namely, an alternative removable external power base 15 as installed by the  
30 user on the GPS receiver 2 in place of the standard battery power base 6 in FIGURE 1A. Further details are provided below in this disclosure relative to FIGURES 2A, 2B, 5A, 5B and 5C.

**FIGURE 1B** particularly shows a first optional added cable **8** with a separate power cable **9** and fitting or connector **12**, plus a separate data cable **10** and fitting or connector **11**. The separate power and data lines are joined in a "Y" configuration at an adaptation connector or fitting **13** -- such that both power and data are fed through the standard data/power cable **3** attached to the GPS receiver **2**. The optional cable **8** transmits data between the GPS receiver **2** and the PPC **1** by connecting to the PPC COM port **5** at **11**. External electric power is supplied at **12**, for example, by a standard connector, plug or fitting for use with a cigarette lighter receptacle or outlet as commonly found in automobiles and other personal vehicles. Thus, the **FIGURE 1B** cabling alternative **8** facilitates an external power source for the GPS receiver **2** for extended use or in case standard replaceable batteries for the GPS receiver **2** have worn out, for example, for use of the GPS receiver **2** as a PPC peripheral in a vehicle.

**FIGURE 1C** specifically illustrates a second optional, added cable **20** also joined in a "Y" configuration at a GPS end or connector at **23**. Data transmission between the GPS receiver **2** and the PPC **1** is also facilitated by another COM port connection at **21** and **5**. But, the electric power for the GPS receiver **2** is provided in **FIGURE 1C** by connection at **22** to the extra keyboard/mouse port at **25** which provides about 5 volts DC and 0.01 to 0.3 amps DC of electric power for standard input/output peripherals such as a computer mouse or an extra keyboard on typical PPCs such as laptops, notebooks and PDAs. In this **FIGURE 1C** arrangement of cables, both data signals and electric power are transmitted by means of the data/power cable **3** attached to the GPS receiver **2**.

**FIGURES 2A** and **2B** present side views of the GPS receiver **2** according to the present invention. **FIGURE 2A** shows the GPS receiver **2** with a removable standard battery power base **210** or bottom cover, while **FIGURE 2B** shows an optional removable external power base **220** or bottom cover.

**FIGURES 2A** and **2B** show several common GPS receiver features such as a top cover or outer case **200**, a GPS printed wiring board (PWB) **202** comprising the essential integrated circuits of the GPS receiver **2**, an attached



standard data/power cable 203 (also shown heretofore at 3 in FIGURES 1A, 1B and 1C), and a power supply trunk 205 or three-position male connector for electrical power to the PWB 202, as further detailed in FIGURE 5A hereinafter.

FIGURE 2A includes a side view of the standard battery power base or bottom cover 210 in which standard "AA" or equivalent sized replaceable retail batteries 207 are installed providing electric power to the PWB 202 through typical wiring and/or connections as shown at 215 and 205. The wiring and connection of the standard battery base 210 shown in FIGURE 2A are further detailed hereinafter in relation to FIGURE 5B.

FIGURE 2B is a side view of the optional external power base or bottom cover 220, which is installed to provide external power to the GPS receiver 2, by means of an external power jumper 223. For example, this external power jumper 223 may preferably be a three-position female connector as described in more detail relative to FIGURE 5C hereinafter. FIGURE 2C illustrates a preferred design of the external jumper 223, in which power coupling 243 is designed to couple to three-position female connector 543 shown in FIGURE 5C.

FIGURES 3A and 3B present further details pertaining to the first type of optional cable or connection shown more generally heretofore as cable 10 in FIGURE 1B. In FIGURES 3A and 3B, one DB-9 female connector 311 corresponds to the connector 11 in FIGURE 1B for the PPC COM port. In FIGURES 3A and 3B, data 310 and power 309 sides of the cable 10 arrangement are joined in a "Y" configuration at the GPS end or connector 313, specified as a DB-9 male connector, and corresponding to coupling 13 in FIGURE 1B. An external power coupling 312 in FIGURES 3A and 3B, may be a dual-leaf cigarette lighter plug, corresponding to plug 12 in FIGURE 1B. In the FIGURE 3B schematic wiring diagram, a 12-volt DC to 9-volt DC power converter/filter/regulator 315 is further specified and built into the cigarette lighter plug 312 such that, for example, no more than 9 volts DC and 200 milliamps is provided by means of the cigarette lighter plug 312 to the GPS receiver 2. Connector detail in FIGURE 1B is shown from the crimp/solder side; other pins are loaded but not connected; at 310 and 309, 28 AWG wire is

specified. Other features shown in **FIGURES 3A and 3B** will be quite obvious to one skilled in the art.

**FIGURES 4A and 4B** illustrate further details of the second type of optional cable for connecting the PPC 1 and the GPS receiver 2, corresponding to cabling 20 in **FIGURE 1C**. In **FIGURES 4A and 4B**, a COM port connector 421 (specified as a DB-9 female) and a keyboard/mouse connector 422 (specified as a 6-pin mini DIN fitting) correspond to components 21 and 22 respectively in **FIGURE 1C**. The COM port data cable and the keyboard/mouse port power cable join in a "Y" configuration in **FIGURES 4A and 4B** at 423 (specified as a DB-9 male connector) which corresponds to location 23 in **FIGURE 1C**. Other features shown in **FIGURES 4A and 4B** will appear obvious to one skilled in the art.

**FIGURES 5A, 5B and 5C** present physical layouts showing an overview of a GPS receiver printed wiring board or PWB 505 in a GPS case 502, and a standard battery power base at 531, and an optional external power base 539, respectively. The GPS receiver case 502 was shown heretofore at 2 in **FIGURES 1A, 1B and 1C**, and at 200 in **FIGURE 2A**. The PWB 505 was shown at 202 both in **FIGURES 2A and 2B**. The standard battery power base 531 was shown at 6 in **FIGURE 1A** and at 210 in **FIGURE 2A**. The external power base 539 was shown in less detail at 15 in **FIGURES 1B and 1C**, with a detailed side view presented at 220 in **FIGURE 2B**. As should be obvious to a skilled technician from all these drawings, the 531 standard battery power base and the 539 optional external power base involve alternate bottom covers for the GPS receiver case at 502 in **FIGURES 5A, 5B and 5C**.

**FIGURE 5A** shows an attached GPS data/power cable 503, corresponding to cable 3 in **FIGURES 1A, 1B and 1C** and cable 203 in **FIGURES 2A and 2B**. In relation to **FIGURE 5A**, 504 is specified as a DB-9 female connector; 507 is Data Out; 509 is Data In; 511 is Data Terminal Ready; 513 is Power Ground/Signal Reference; and 515 is DC Power In. 517 is the Power Ground; 519 is External Power; and 521 is Battery Power In -- feeding a three-position male power supply trunk 525 in **FIGURE 5A**. The other features shown in **FIGURES 5A, 5B and 5C** will appear obvious to one skilled in the art.

With continuing reference to the coupling of the power supply components of the present invention shown in FIGURES 5A-5C, there is specified a power supply trunk that is shown preferably as a three-position male connector 525 corresponding to the power supply trunk 205 for the PWB 202 as shown in FIGURES 2A and 2B. The three-position male connector 525 mates with a three-position female connector or jumper 533 for the standard battery power base in FIGURE 5B, and also mates with an identical, identically placed but differently wired three-position female connector 545 on the external power base 531 in FIGURE 5C. Thus, whether an internal battery or an external power is provided to the GPS receiver PWB board 505 is determined by the power base chosen and installed by the user – in conjunction with positive (+) 535 and negative (-) 537 battery power lines in FIGURE 5B or the external power jumper at 543 in FIGURE 5C. That is, when the standard battery power base 531 is coupled to the GPS receiver case 502, internal power is supplied to the GPS receiver 2 through the coupling of positive terminal 535 to terminal 521 and negative terminal 537 to terminal 517, with terminal 519 left open. On the other hand, when the external power supply case 539 is coupled to the GPS receiver case 502, external power through connection 515 is supplied to the GPS receiver 2 through the coupling of terminals 519 and 521 to the terminals of external power jumper 543.

The invention description herein is directed to a specific embodiment, however, it is apparent that many modifications and variations could be implemented by one skilled in the art without departure from the spirit and scope of the novel concepts of the present invention.

## I CLAIM:

1. A device for supplying power to a global positioning system (GPS) receiver and for coupling the GPS receiver to computer means for an  
5 interchange of data therebetween, said device comprising:
  - a. an adaptive removable power supply base attachable to the GPS receiver and to an external power source; and
  - b. an interface cabling system including a first end for coupling to the  
10 GPS receiver and a second end for coupling to the computer means.
2. The device as claimed in **Claim 1** wherein said interface cabling system includes:
  - a. means for coupling to a data communications port of the  
15 computer means; and
  - b. means for coupling said removable power supply base to the external power source.
3. The device as claimed in **Claim 2** wherein said interface cabling system  
20 includes:
  - a. a first cable having a first GPS receiver end for coupling to the GPS receiver; and
  - b. a second cable having a coupling end for coupling to said first  
25 cable, and a data/power end for coupling to said data communications port of the computer means and to the power source.
4. The device as claimed in **Claim 3** wherein said data/power end of said  
second cable includes a data cable for coupling to said data communications  
30 port, and a separate power cable for coupling to the power source.

5. The device as claimed in **Claim 4** wherein said separate power cable is designed to couple said second cable of said interface cabling system to an external power source.
- 5 6. The device as claimed in **Claim 5** wherein said separate power cable includes an adaptive end for coupling to an automobile power outlet.
7. The device as claimed in **Claim 6** wherein said adaptive end is designed to fit an automobile cigarette lighter outlet.
- 10 8. The device as claimed in **Claim 4** wherein said separate power cable includes an adaptive end designed to couple said second cable of said interface cabling system to a power source connector of the computer means.
- 15 9. The device as claimed in **Claim 8** wherein said adaptive end of said separate power cable is designed to couple said second cable to a keyboard port of the computer means.
- 20 10. The device as claimed in **Claim 8** wherein said adaptive end of said separate power cable is designed to couple said second cable to a mouse port of the computer means.
- 25 11. The device as claimed in **Claim 8** wherein an adaptive end of said data cable is a DB-9 female connector and said coupling end of said second cable includes a DB-9 male connector for coupling said second cable to said first cable, and wherein said adaptive end of said separate power cable is a 6-pin mini DIN fitting.
- 30 12. The device as claimed in **Claim 4** wherein an adaptive end of said data cable is a DB-9 female connector and said coupling end of said second cable includes a DB-9 male connector for coupling said second cable to said first cable.

13. The device as claimed in Claim 12 wherein said separate power cable includes an adaptive end for coupling to an automobile power outlet, and wherein said adaptive end is coupled through a voltage regulator to said DB-9 male connector.

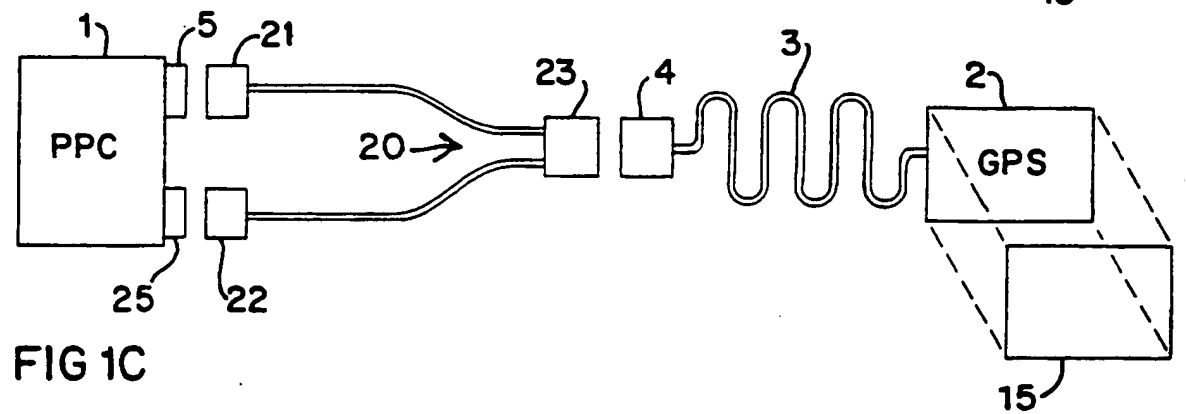
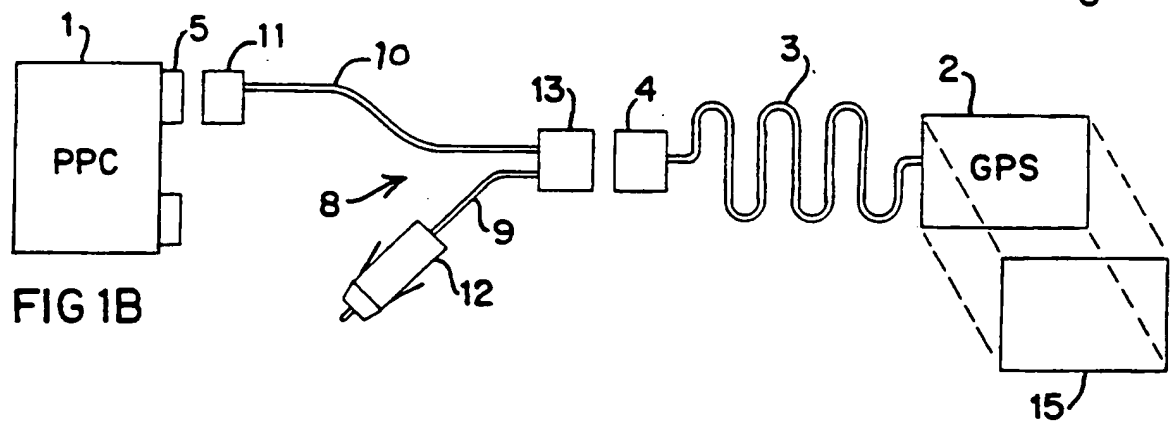
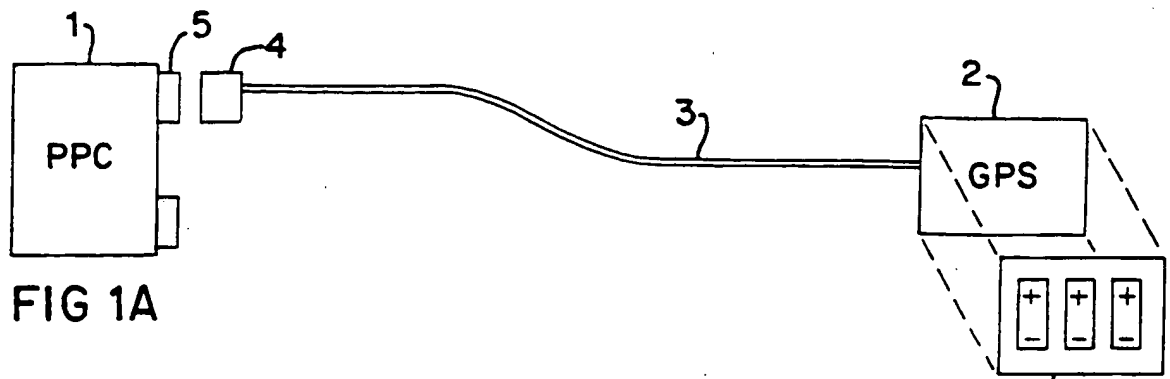
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14. A device capable of supplying power to a Global Positioning System (GPS) receiver and capable of exchanging data between the GPS receiver and computer means, the device comprising a combination data/power cable having a plurality of conductive leads, wherein a first portion of said conductive leads are data coupling leads for providing interfacing between a data port of the  
10 computer means and a data port of the GPS receiver, and wherein a second portion of said plurality of conductive leads are power coupling leads for optionally providing power to the GPS receiver.

15. The device as claimed in Claim 14 wherein the GPS receiver includes an independent battery pack for supplying power thereto and wherein said power coupling leads are inactive when said combination data/power cable is coupled to the data port of the computer means.

20 16. The device as claimed in Claim 14 wherein the computer means includes a mouse port, said device further comprising an adaptive second cable having a first coupling end for connecting to said combination data/power cable, and a second coupling end having a separate data terminal for coupling to the data port of the computer means and a separate power terminal for coupling to the  
25 mouse port of the computer means.

17. The device as claimed in Claim 14 further comprising an adaptive second cable having a first coupling end for connecting to said combination data/power cable, and a second coupling end having a separate data terminal  
30 for coupling to the data port of the computer means and a separate power terminal for coupling to an independent power supply.



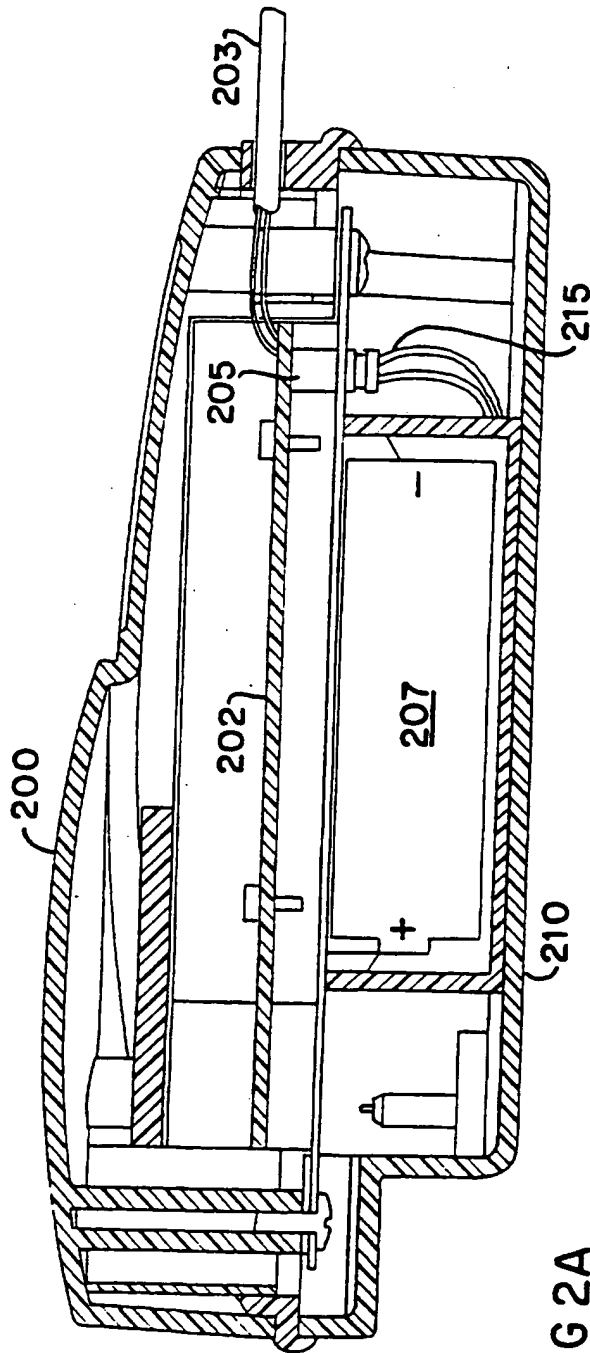


FIG 2A

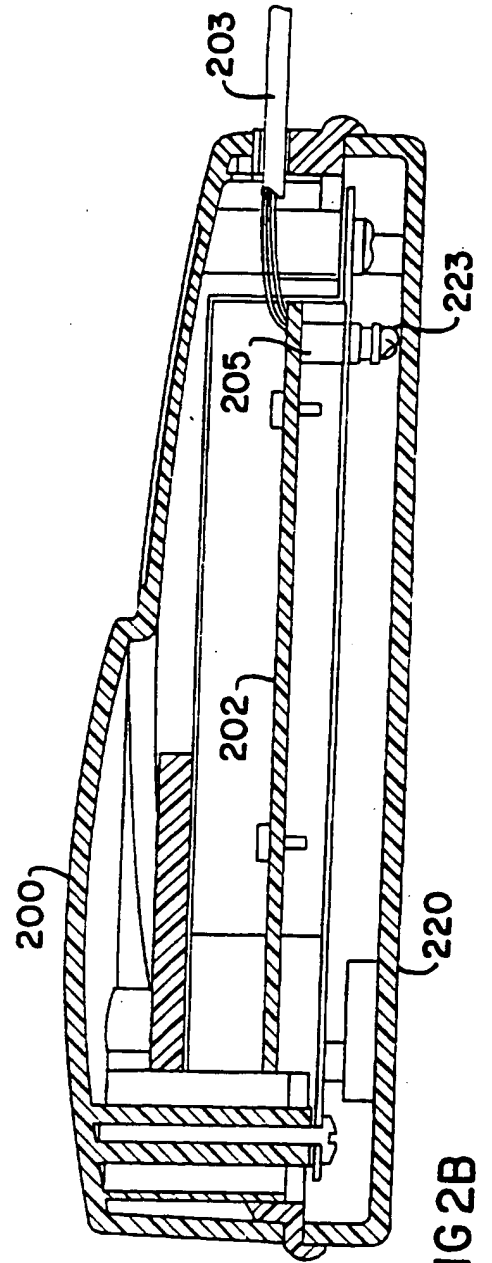
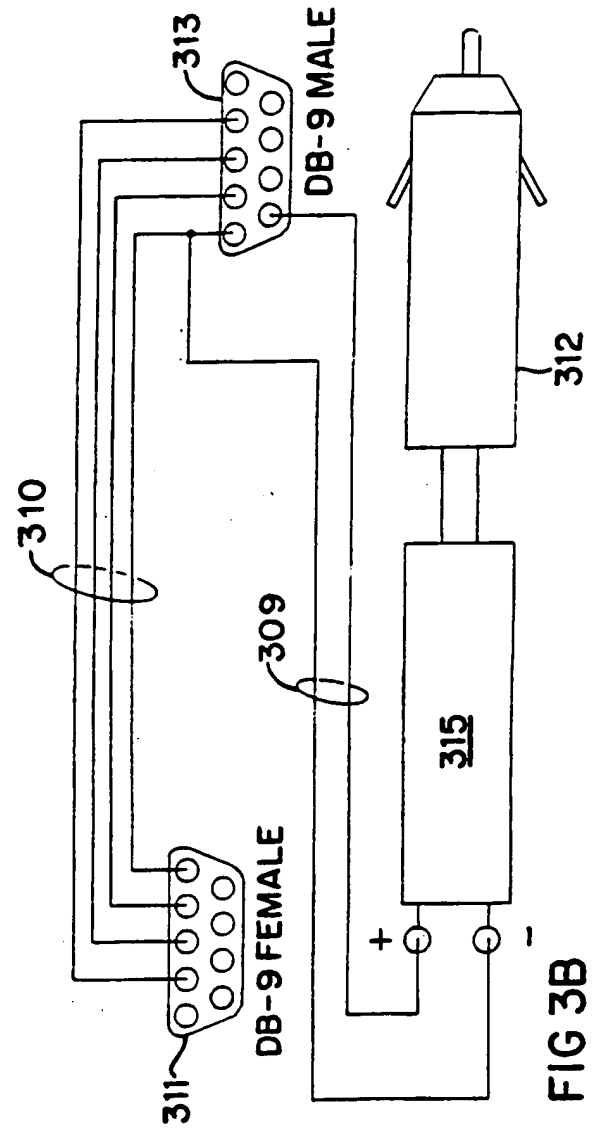
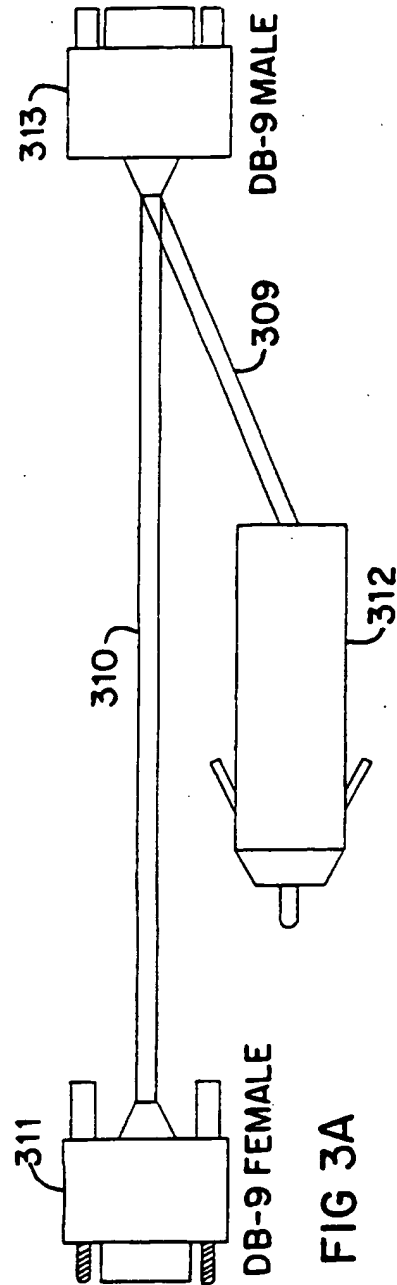
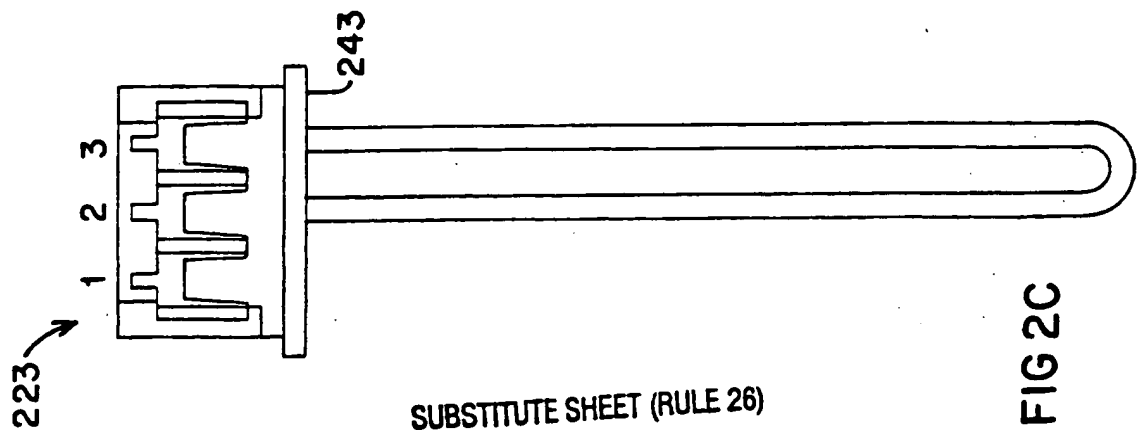


FIG 2B





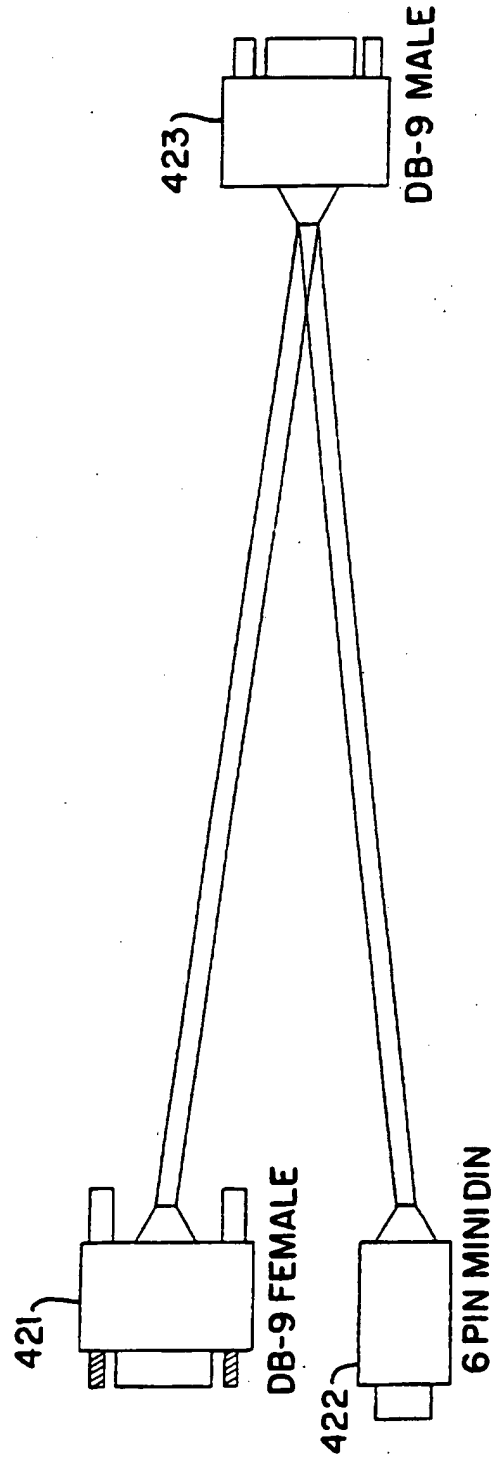


FIG 4A

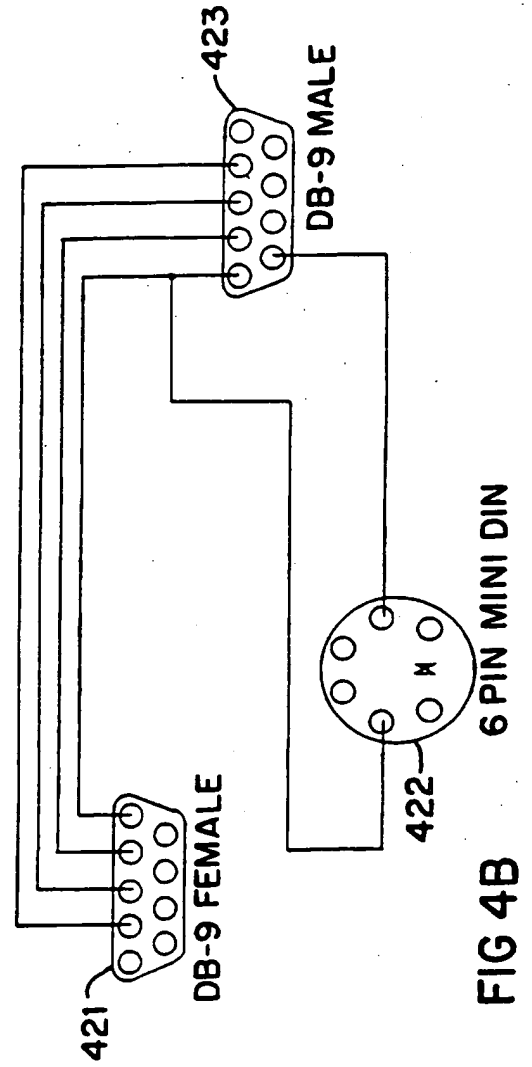


FIG 4B

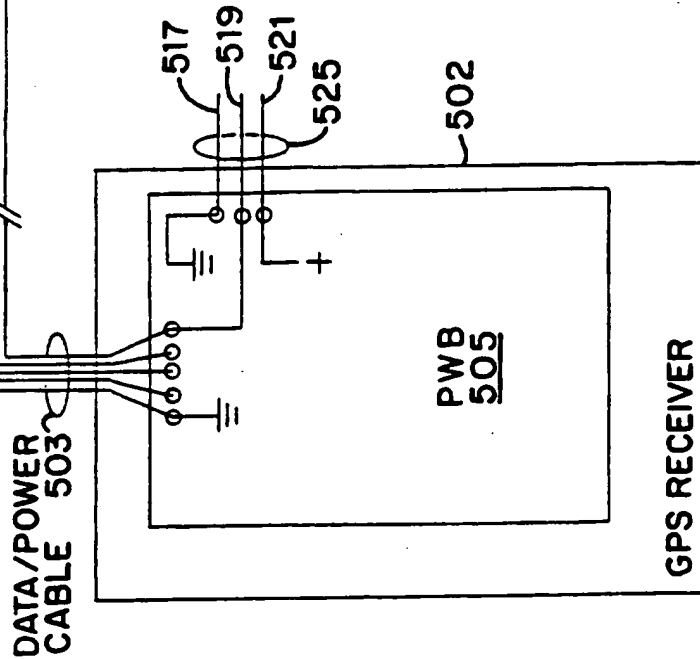
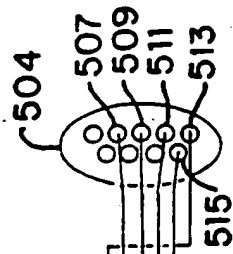
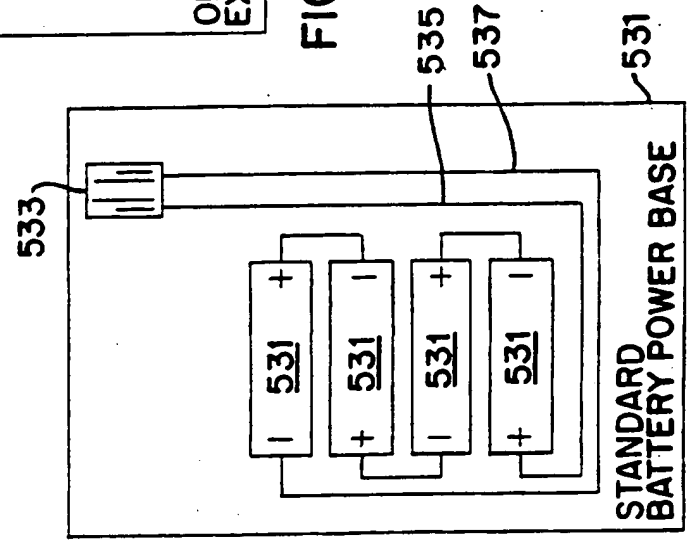
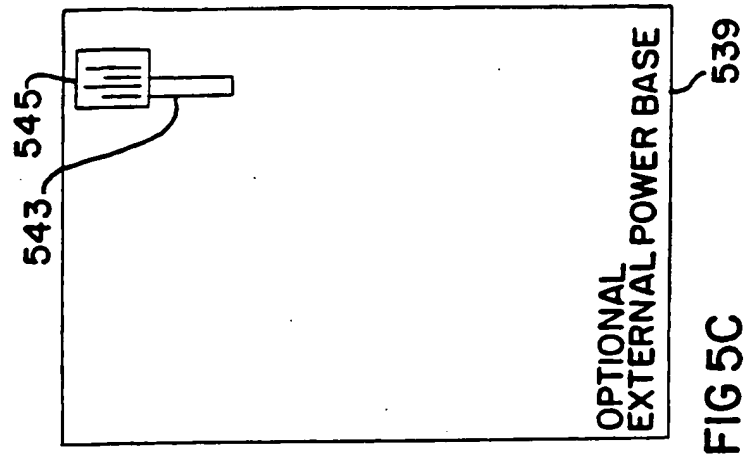


FIG 5A

FIG 5B

FIG 5C

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US97/16429

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) :H04L 23/00

US CL :375/377; 364/492, 705.05, 707, 708.1; 455/349, 351, 572, 575

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. :

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Please See Extra Sheet.

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,E	US 5,675,524 (BERNARD) 07 October 1997, see entire document, especially column 4, lines 33-47.	1-17
Y	US 5,532,524 (TOWNSLEY et al) 02 July 1996, page 1, abstract, entire document, especially column 6, lines 57-63.	1-13
Y	US 5,517,683 (COLLETT et al) 14 May 1996, see entire document claims 1-12, and especially columns 8-9 lines 35-67, and 1-21 respectively.	1-17
Y	US 5,497,339 (BERNARD) 05 March 1996, see entire document especially, column 3, lines 59-67, and 1-9 respectively.	1-17

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but used to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be of particular relevance	*X	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*A*	document member of the same patent family
*O* document referring to an oral disclosure, use, exhibition or other means		
*P* document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 12 NOVEMBER 1997	Date of mailing of the international search report 26 JAN 1998
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer <i>Joseph Roundtree</i> JOSEPH ROUNDTREE Telephone No. (703) 306-3033

**INTERNATIONAL SEARCH REPORT**

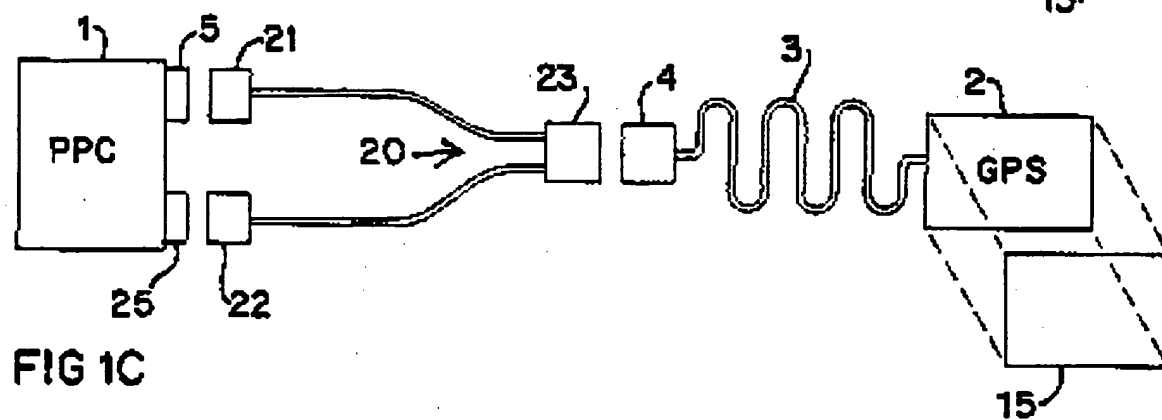
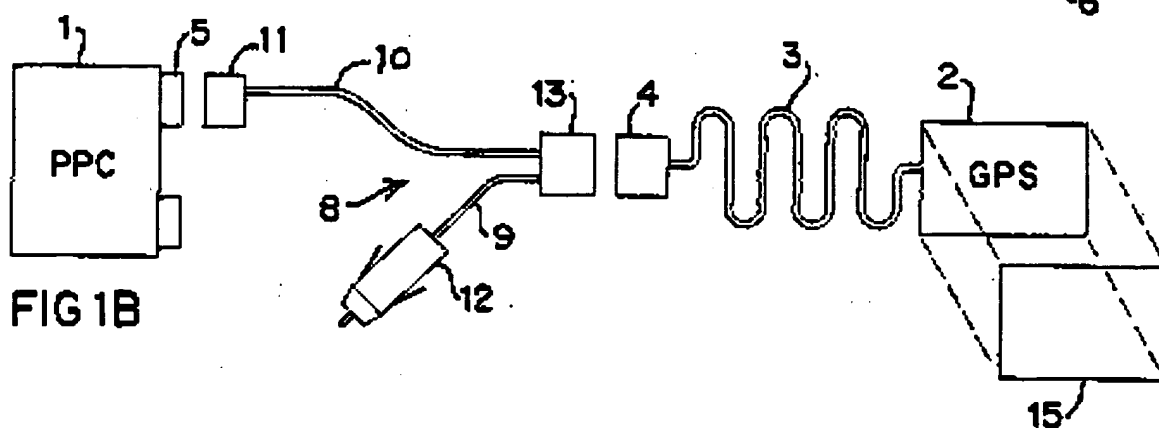
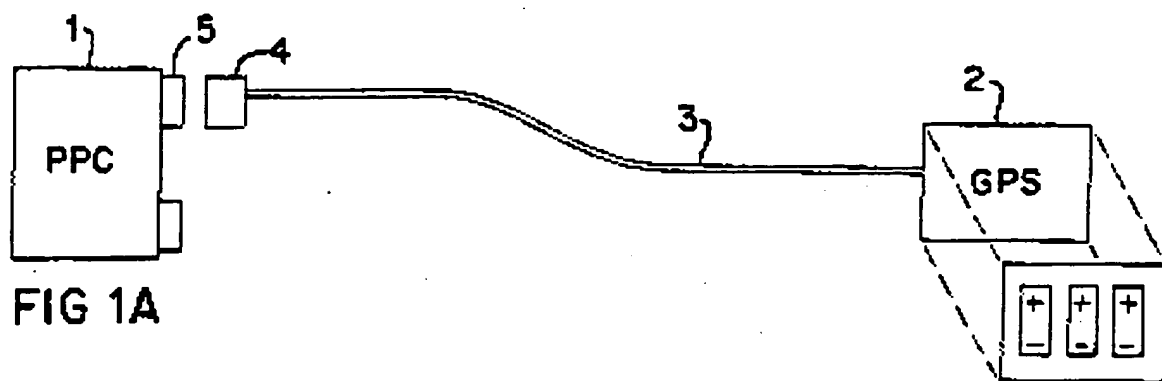
International application No.

PCT/US97/16429

**B. FIELDS SEARCHED**

Electronic data bases consulted (Name of data base and where practicable terms used):

STN/APS: remote external power ( supply, source, connector, cable), removable, detachable, attachable, communication port, com port, power interface, data communications (port, interface), communication port, and GPS



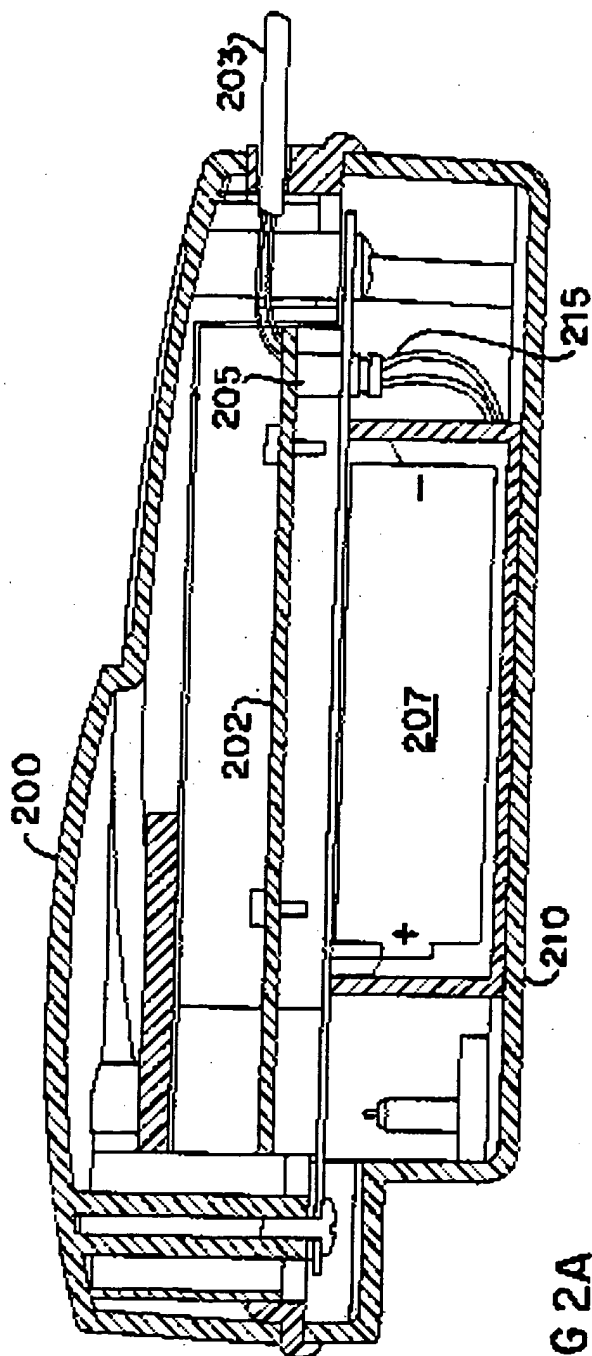


FIG 2A

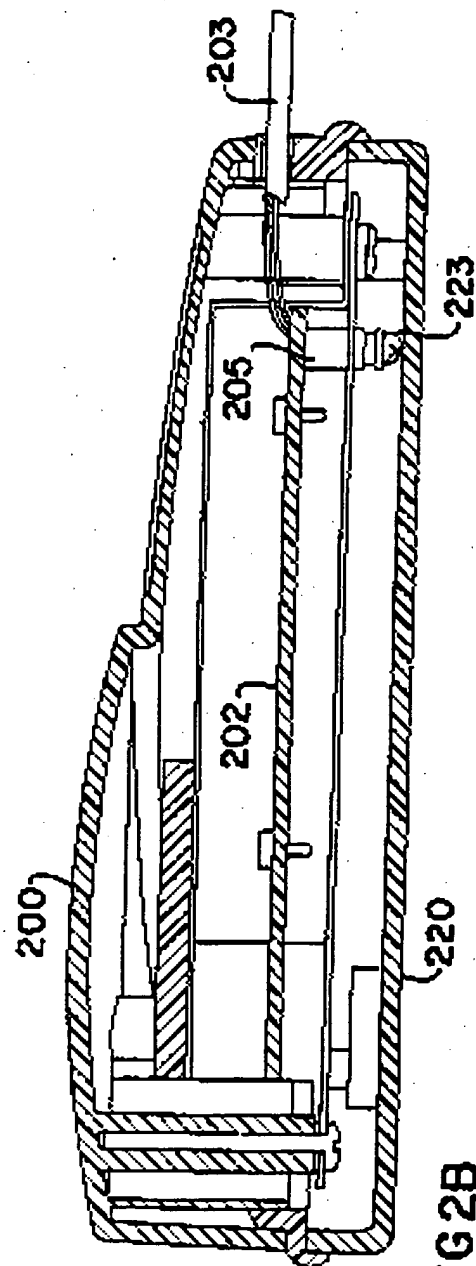


FIG 2B

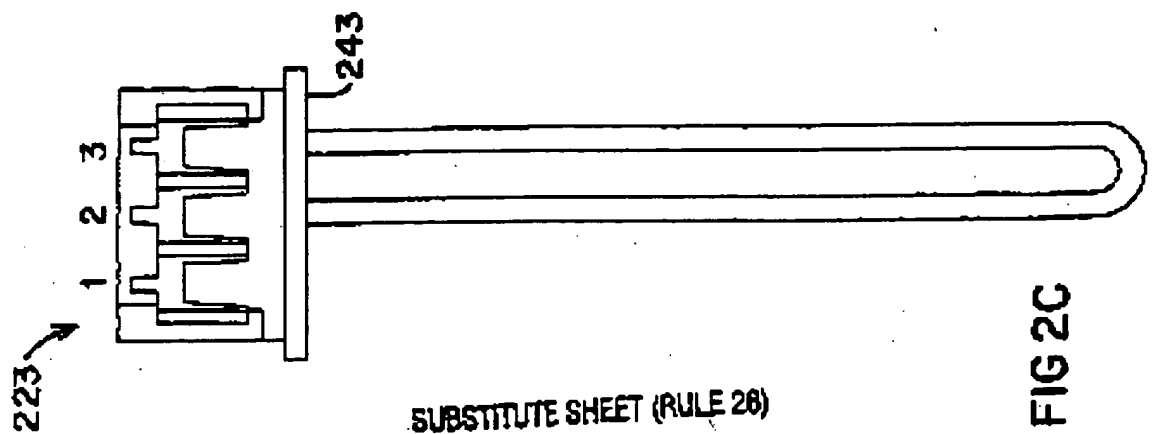


FIG 2C

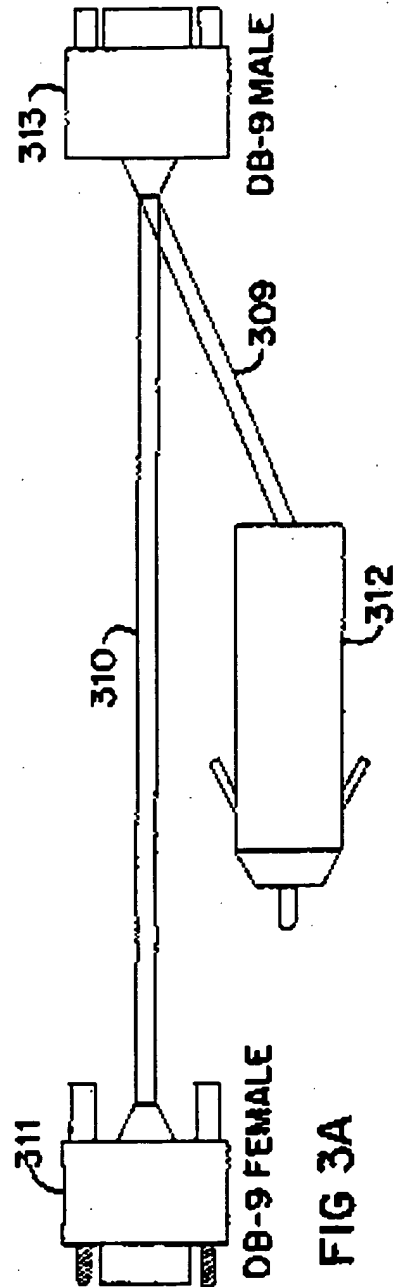


FIG 3A

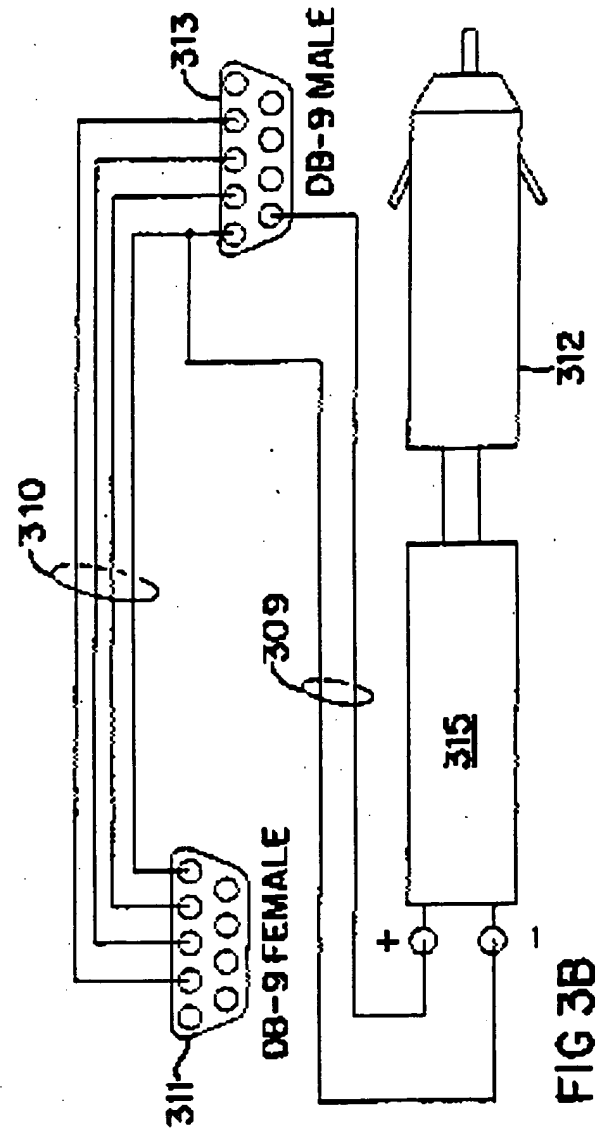
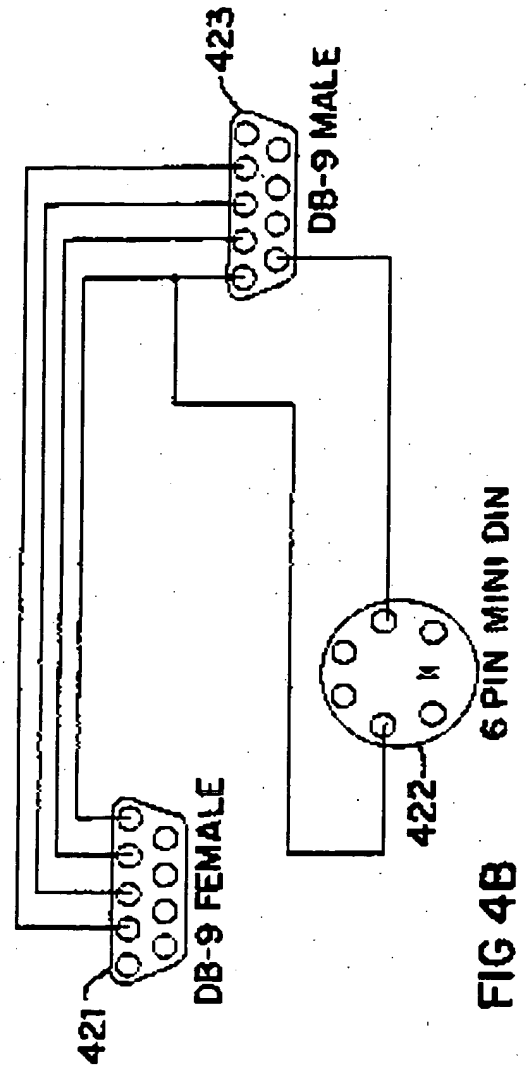
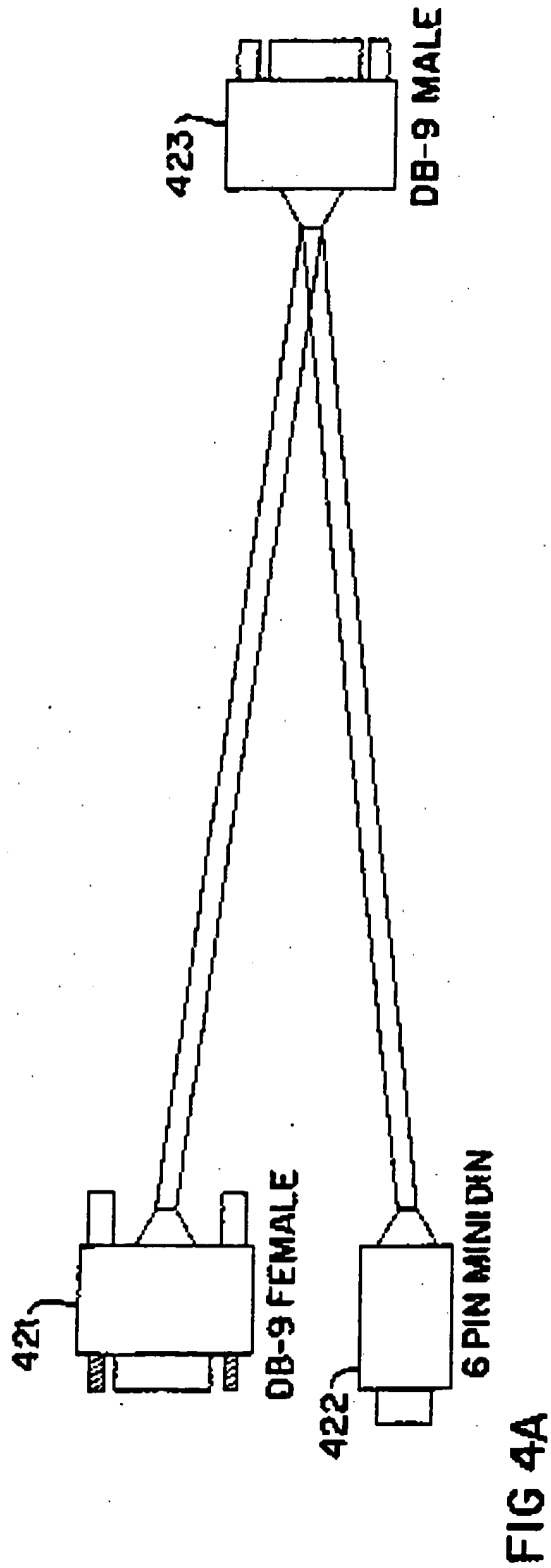


FIG 3B





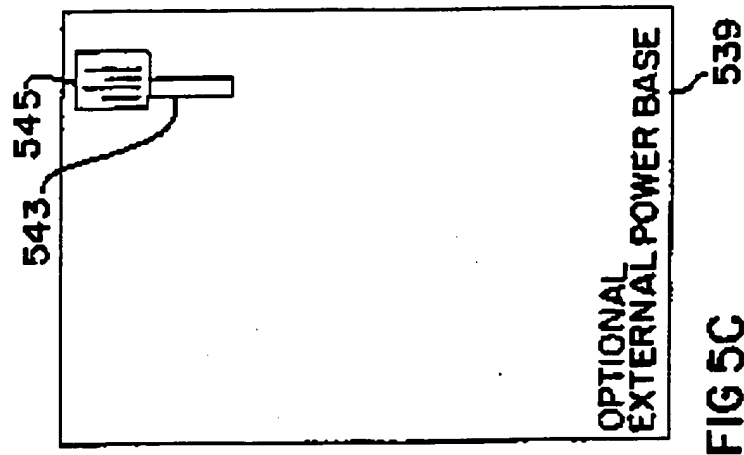


FIG 5C

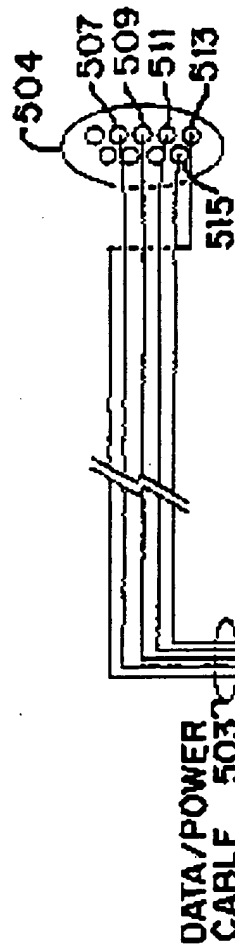


FIG 5A

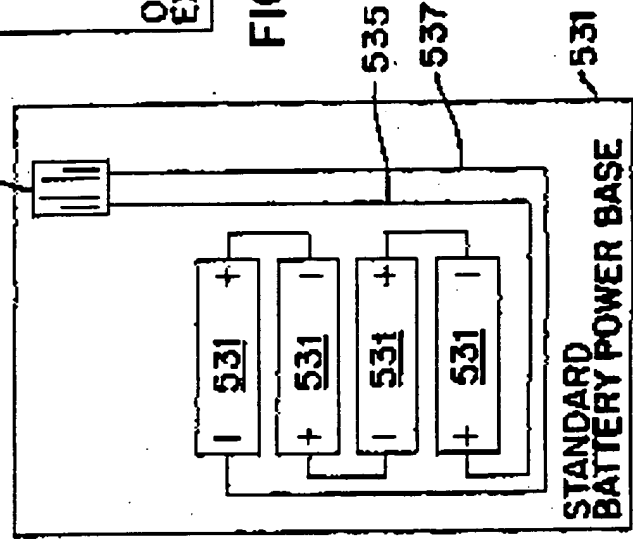


FIG 5B